on May 19. Possibly the noctilucent clouds photographed by myself in 1910[3] are to be attributed to foreign matter carried in by Halley's comet.

With the noctilucent cloud at a constant height there exists a relation between the distance of the sun below the horizon and the zenith distance to which the clouds are visible; they remain bright so long as they receive the direct light of the sun. The values for 1910[4] conform to the relation derived by Jesse for noctilucent clouds as well as might be expected.

It may be stated that in this case also the noctilucent clouds had an elevation of some 80 km., although no direct determinations from two stations are available. During the time of photographing, the sky was entirely clear, with no artificial light on the horizon. The direction of the cloud streaks or ridges was northwest to southeast and the direction of movement the same. The west-east component of velocity was somewhat above 20 m. p. s. On July 17, 1910, after a wonderful red sunset, I saw at about 10:05 p. m. noctilucent clouds extending up beyond Capella. At 10:15 p. m. the brightest streak was prolonged in a southerly direction and another streak had become visible to the left and below. After 10:35 p. m. the streaks were no longer visible in the clear sky.

Doctor Korn reported to me by letter on an observation made at the same time. With Lieke he observed at Wongrowitz (52° 48′ N., 17° 22′ E.) on June 24, 1910, at 11 p. m., noctilucent clouds in the north—cirrus forms that shone with silver light up to 1.5° below Capella, which was almost exactly north. From north they extended 15° to the east and 30° to the west. Doctor Korn observed the optical disturbances of May 19–25, 1910.

Information on the years in which noctilucent clouds have been observed is given in *Beiträge zur Kenntnis der Dämmerungserscheinungen und des Alpenglühens* by P. Gruner (Zurich, 1925). There is, however, no reference to the observations in June, 1910.

Since the noctilucent clouds will certainly return, I hope that through the above details the interest in these phenomena will be revived.—*Translated by W. W. Reed.*

[3] 6 reproductions accompany the original text. [4] Table not reproduced here.

NOTES, ABSTRACTS, AND REVIEWS

THE MAGNETIC STORM AND AURORA OF JULY 7–8, 1928

An unusually extensive auroral display was observed over nearly all parts of the country on the night of July 7–8. This display was noted locally from the northern border to the Rio Grande and in central Florida, and from the Atlantic to the Pacific. At many points the display was indicated as being of unusual brilliancy, and its effect on wire communications was distinctly noticeable, some stations reporting that on account of clouds the manifestation was not visible, but its presence was reliably indicated by wire troubles.

In some sections it was reported as being the first auroral display ever observed in a midsummer month. Following are several reports of this auroral display.—*P. C. Day.*

London, England.—A magnetic storm, accompanied by a display of the aurora borealis, took place during the night of July 7 and morning of July 8. The magnetic disturbance reached a maximum between 1 and 2 a. m. on July 8. About this time, also, the horizontal force and vertical force traces went off the recording sheets. The ranges of these two elements exceeded 500 during the storm. This magnetic storm is probably the largest recorded at Greenwich since that of May 13–17, 1921—it is certainly the largest since that of October 15–16, 1926.

At the time of this recent storm there was a moderate-sized group of sunspots just past the sun's central meridian. Possibly spectroscopic observations which may have been made of this group will show it to have been unusual. There was a much larger group on the disk at the time, but this was a considerable distance east of the central meridian. The sun's general activity shown by the spots has been increasing during the last few weeks.—*Nature, London, July 21, 1928, p. 108.*

Worcester, Mass.—I first saw the display at 9 p. m., when it covered virtually the entire sky down to about 10 above the SSE. horizon. This part of the display, from 9 to 9:15, was one of considerable brilliance and was marked not only by its extensiveness and the auroral corona but also by large patches of intense red or green. The exceedingly clear air and sky favored a fine view of the display. Immediately after this bright phase, from 9:15 to 9:30, there were four distinct arches, two overhead and two in the north, while two in the southern sky had faded but could still be distinguished. At 10:15 the display was still extensive but not so bright.

At 10:40 the display was entering on another stage of great brightness, color, and extent. Colors appeared at 10:45, rapidly becoming bright. The greens carried the most light, while the reds, varying from crimson to fire glow, were rich in tone. The display again extended far into the south down to within about 10 of the horizon, the southernmost arch being very bright. The corona formed brilliantly overhead and to the SSE. of the zenith. The total light was sufficient for reading. At 10:52 the display began to flicker. There was considerable motion in the corona.

From 10:55 to 11 a steady, progressive motion of auroral lights across the zenith was noted and roughly measured as to angular velocity. The mean of four observations was 0.1 radian in 10 seconds. At a height of 100 km. this would mean a velocity of 1 km. per second. I assume that this motion may be taken to represent the wind at that great height.—*Charles F. Brooks, Clark University.*

Sheepshead Bay, N. Y., July 7–8, 1928.—I first noticed it at Sheepshead Bay right after sunset, Saturday night, in the form of what appeared to be a vivid greenish yellow cloud of sulphur smoke that suddenly grew in the eastern sky and quickly faded away. A captain of a fishing boat said he also noticed this phenomenon in the eastern sky while the sun was still above the horizon.

At 9:30 there gradually glowed into pronounced brilliance, halfway up in the southern sky, a broad bow of yellowish-white light which stretched completely from the eastern to the western horizon along the ecliptic. At 10 p. m. the characteristic aurora borealis sheets, streamers, bands, and rays, red, green, yellow, white radiated from the zenith to the northeast horizon. It had faded by 11 p. m. with the exception of a few faint rays in the northern sky.

About 2:30 a. m. auroral streamers again began to grow in the northern sky, and by 3 a. m. and until dawn the sky was resplendent with as brilliant an aurora borealis as is seen in this vicinity. It blazed, sizzled, pulsated, seethed, and flashed with an awesome brilliance in all the colors of the rainbow.

At times the entire northern sky rippled with what appeared to be moonlight on ocean billows or licking white flames. And New York slept during this glorious celestial commotion!—*E. E. Cockefair, Brooklyn, N. Y.*

Aurora cuts off Winnipeg from the world.—WINNIPEG, MANITOBA, *July 9.*—Electric storms, torrential rain, and aurora borealis have combined to disrupt the normal life in the central areas of Canada during the last 24 hours.

For the greater part of the forenoon Winnipeg had only partial telegraphic communication with the outside world, while both railway and highway travel was hard hit by a rain of cloudburst proportions.

Telegraphic services were affected by the violent play of the mysterious northern lights across the entire continent. Advices received here were that the interruption was one of the most widespread in years. Commercial and private wires, however, were not so hard hit as press lines.

Railway schedules were delayed on the main line of the Canadian Pacific Railway as the result of a cloudburst near Ingolf, Ontario, which washed out much trackage and derailed a freight train of 22 cars. Another freight train derailment at Biscotasing, Ontario, east of Chapleau, brought down many telegraph poles and disrupted communication east and west.

According to an official statement issued by the Canadian Pacific officials, all trains over the main line will be rerouted over Canadian National routes. It is expected that about 26 hours will be required to repair the damage to the tracks in the cloudburst zone.

Rainfall ranging from more than 1 to 3.28 inches was reported in points on the prairies.

Little Rock, Ark., July 7–8, 1928.—The aurora was first noticed about 9:30 p. m. of the 7th. By 10 p. m. it was very bright, a perfect arch being visible. No clear sky was visible below the arch, however, as is usually seen farther north. Just the upper portion of the arch rested on the horizon. It continued a large portion of the time until the morning of the 8th.

The red and old-rose colored haze was very prominent during the early part of the display, great banks of haze to the east and west of the North Star, with the beams passing slowly from west to east. The beams moved much slower than usual. Later the colors faded, leaving mostly white light. Stars could be plainly seen through the aurora, even through the dense banks of haze where the brilliant colors occurred. The beams extended nearly to the zenith at times.

This was decidedly the brightest aurora seen in Arkansas in the past 14 years.—*H. S. Cole, Weather Bureau.*

Little Rock, Ark., July 7–8, 1928.—One of the most brilliant displays of the aurora borealis, or to those who find such pronunciation tests difficult, the northern or polar lights, ever seen in Arkansas illuminated the northern horizon Saturday night.

So pronounced was the phenomenon, which is seldom clearly seen except in the Middle or Northern States, that the attention of hundreds of people was attracted to what was believed by many to be the reflected glow of a monster fire in the north.

The display was definitely identified by H. S. Cole, local meteorologist, as the aurora borealis, and the phenomenon was the brightest he could recall having been seen this far south. The polar lights are often seen in the far Northern States, Mr. Cole said, but in the past 14 or 15 years he could recall such display on only two or three previous occasions. At none of these times, he said, were the lights so pronounced.

Viewed last night, the northern lights, first coming into distinct view for minutes at a time and then fading entirely from sight for a brief period, seemed to assume green and slightly pink tinges, the green next to the horizon.

CALLERS BESIEGE DEMOCRAT

Dozens of calls were received by the Arkansas Democrat from persons who believed the glow to come from a great fire in the north. Calls were also received from various towns in other parts of Arkansas, where undoubtedly the polar display was more pronounced than in Little Rock because of the fact that the lights of this city so illuminated the sky that there was considerable interference with the view. One long-distance call came to the Democrat from Bigelow, where excitement was running at high pitch over what was believed to be signs of a devastating fire at Morrilton, away to the north. Conway was among the other towns which sought information from the Democrat.

One of the peculiar effects of the phenomenon, believed to be occasioned by the passage of electricity through the upper regions of the atmosphere, is interference with wire communication, particularly the telegraph, and several instances of such interference were reported Saturday night. Some cases of radio interference were also believed to have resulted from the polar demonstration.

The aurora borealis usually manifests itself by streams of light ascending toward the zenith from a dusky line of clouds or haze a few degrees above the horizon, and stretching from the north toward the east and west so as to form an arc with its ends on the horizon. The different rays of the display were clearly seen—are constantly in motion. Sometimes it appears in detached places; at other times it may cover practically the entire sky. It assumes many shapes and a variety of colors.

What are known as magnetic storms almost inevitably accompany the exhibitions of the aurora.—*Arkansas Democrat, Little Rock, Ark.*

Newport, N. H.—While stopping at Newport, N. H., the aurora of the evening of July 7, 1928, was called to my attention at 10 o'clock. At that time the entire sky looked as if covered with an irregular layer of thin, luminous clouds, changing and pulsating. Faint rose-colored tints were observed, especially in the south, but the general color as I saw it was whitish. There was no auroral arch, and no streamers were seen to rise from any point above the horizon. Overhead I noted a slight convergence of luminous waves about 2° south of the zenith. At 11 o'clock, when last observed, the phenomenon had faded to a great extent.—*Willis E. Hurd.*

Chesterbrook, Fairfax County, Va., July 7, 1928.—The aurora was first seen at 8:50 p. m. Near the horizon it covered from azimuth 105° to 255°. Above the Pole Star it reached up to 70° altitude. It seemed to be veiled by thin, even clouds; color very light yellow or pure white; appeared evenly diffused, without flashing or shifting motion. Last seen at 9:30 p. m.—*Herbert C. Hunter, Climatological Division, Weather Bureau, Washington.*

The International Commission for Synoptic Weather Information.[1]—The meeting of the International Commission for Synoptic Weather Information that was held in London during the week May 29 to June 2, 1928, marked another step in the progress toward the ideal of the world weather map. The last previous meeting of the commission was held at Zurich in September, 1926. Meanwhile the International Radio Telegraph Conference had met at Washington in the autumn of 1927.

[1] Abstracted from a report by Lieut. Col. E. Gold, F. R. S., in Meteorological Magazine for August, 1928, London.

Progress toward the ideal program in collecting synoptic weather reports was made when the International Telegraph Conference at Paris gave international priority to meteorological messages, and further assistance was rendered by the grant at Washington of the same priority with respect to radio messages.

Even more important from the point of view of synoptic meteorology in Europe was the resolution of the Washington conference that two wave lengths should be reserved for use in Europe in the distribution of collective synoptic reports.

The Synoptic Commission had to decide whether each country issuing collective synoptic reports should be asked to adopt one or other of these two wave lengths, or whether the existing scheme for the exchange of reports in Europe should be replaced by a different one.

Under the new plan proposed by the commission the reports from all the countries of western Europe would be issued from a wireless station in one of the reserved wave lengths in France; those from the rest of Europe, excluding Russia and the Balkans, would be issued from a station in Germany on the other reserved wave length. The reports from Russia and Siberia would be transmitted from an existing station whose wave length is already fixed and is different from the wave lengths for the rest of Europe.

The second important question considered by the commission was that of arranging for the synoptic representation of the oceans. A special subcommittee had been appointed at Zurich to consider the method of collecting and distributing oceanic reports. The subcommittee met in Paris in May, under the chairmanship of General Delcambre, Director of the Meteorological Office of France, and prepared a scheme for the consideration of the commission. The commission gave its approval of the scheme which includes the collection of reports from all ships at a selected wireless station and for the repetition of the reports received for the benefit of all countries. It is anticipated that one collecting and distributing point will be at the Azores.

The scheme further provides for the reports to be made in a universal code and for the observations to be made at standard hours of Greenwich time in all oceans. * * *

Action was also taken looking toward further revision of the International Code for use in telegraphic reports, in order to extend its use to regions outside of temperate zones and to give an adequate description of the weather in all lands, the new code to be submitted to meteorological services in all countries for their consideration preliminary to a decision being taken at a future meeting of the conference and committee.

Finally, the commission voted that in synoptic messages transmitted by wireless telegraph for international exchange the pressure will be expressed in millibars, and a subcommittee was asked to "consider the question of the unification of reports of temperature in international messages on the basis of the centigrade scale."

The meeting was attended by the Chief of the Weather Bureau and Mr. Calvert, of the forecast division.

Tornado in Wyoming, June 29, 1928.—A small tornado wrecked seven buildings on a ranch near Gillette, Wyo., on June 29, 1928. Mr. H. R. Johnson, cooperative observer at Gillette, observed the storm and saw four funnels pendent from the cloud. He also made a photograph of it, which has been sent to the editor. The cloud was evidently some distance from the camera; one funnel is clearly shown, and there is evidence of two others, but the image of them is too indistinct to stand reproduction.

In Colonel Finley's tornado reports of the early eighties, drawings showing more than a single funnel cloud are rather common, but the photograph in question is the first one the editor remembers to have seen that showed more than a single funnel pendent from the cloud.—*A. J. H.*

Meteorological summary for Chile, June, 1928 (by J. Bustos Navarrete, Observatorio del Salto, Santiago, Chile).—Cyclonic activity was marked during the first half of the month, but thereafter it showed a gradual decrease in frequency. The paths of the depressions had a progressive movement toward the south. Important depressions crossing the southern region: 3d–6th, precipitation from Coquimbo to Magallanes (24-hour amounts of 2.35 to 3.55 inches in the middle region); 8th–11th, excessive rains (6.97 inches at Valdivia on the 9th) and rough weather (north winds with velocities of 37 to 56 miles per hour between Arauco and Chiloe, also on the 9th); 14th–15th, precipitation north as far as Aconcagua; 16th–18th, heavy winds and rain; and 19th–21st, heavy precipitation (2.35 inches in 24 hours at Valdivia). Depressions appeared off the middle coast on the 1st and off the southern coast on the 27th; the former caused rainfall from Coquimbo to Chiloe and the latter brought unsettled weather and general precipitation, ending on the 30th.

Important anticyclones, accompanied by fair, cool weather: 1st–3d, movement from southern Chile to northern Argentina; 7th–9th, movement from Juan Fernandez Islands across middle Chile toward central Argentina; and 22d–27th, the longest period of fine weather, slow movement from Juan Fernandez Islands to Chiloe and thence to Neuquen, Bahia Blanca, and Buenos Aires.

The region receiving rainfall extended from Copiapo to Magallanes. The total precipitation for June was 5.94 inches at Santiago and 25.39 inches at Valdivia.—*Translated by W. W. Reed.*

Meteorological summary for Brazil, June, 1928 (by Francisco de Souza, Acting Director, Directoria de Meteorogia, Rio de Janeiro).—Atmospheric circulation was abnormal, due to the entrance of seven anticyclones and the activity of the continental depression and those of higher latitudes. Most of the anticyclones weakened in moving northeast, and the weather in the region north of the parallel of 25° was less unsettled than it usually is at the season.

In the northern and central regions precipitation was light, 0.70 to 2 inches below normal, but in the southern region it was extremely abundant, averaging 2.70 inches above normal. The rainy weather interfered with preparation of soil and planting and harvesting of cereals in different parts of the extreme south. In the tobacco and cane areas of the central region and in the cotton areas of the northeast the weather was unfavorable on account of lack of rain. Harvesting of cotton, cane, coffee, tobacco, and cereals was under way.

At Rio de Janeiro the weather was alternately fine and unsettled, with less than normal cloudiness. The mean temperature was 3.2° above normal; the highest temperature was 90° on the 7th and the lowest was 51° on the 12th. The extremes for the Federal District, both recorded at Campo dos Affonsos, were 95° on the 6th and 49° on the 11th. Precipitation was deficient, measureable amounts on three days totaling 2.20 inches. Relative humidity was rather low, 2 per cent below normal. The prevailing south winds were fresh at times. The maximum wind velocity was 47 miles per hour from the west on the evening of the 8th.—*Translated by W. W. Reed.*